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Designing Sustainable Landscapes: Representative Species Model: Cerulean Warbler (*Setophaga cerulea*)

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Representative Species Model: Cerulean Warbler (*Setophaga cerulea*)

Cerulean Warbler

Cerulean warbler was selected for the Designing Sustainable Landscapes project of the North Atlantic LCC (https://scholarworks.umass.edu/designing_sustainable_landscapes/) due to its associations with mature deciduous forests along riparian bottomlands or dry mountain slopes and ridges along the Appalachians and Northern Interior. The *Landscape Capability (LC)* index integrates habitat capability, prevalence and climate suitability into a single index that reflects the relative capacity of a site to support the species.

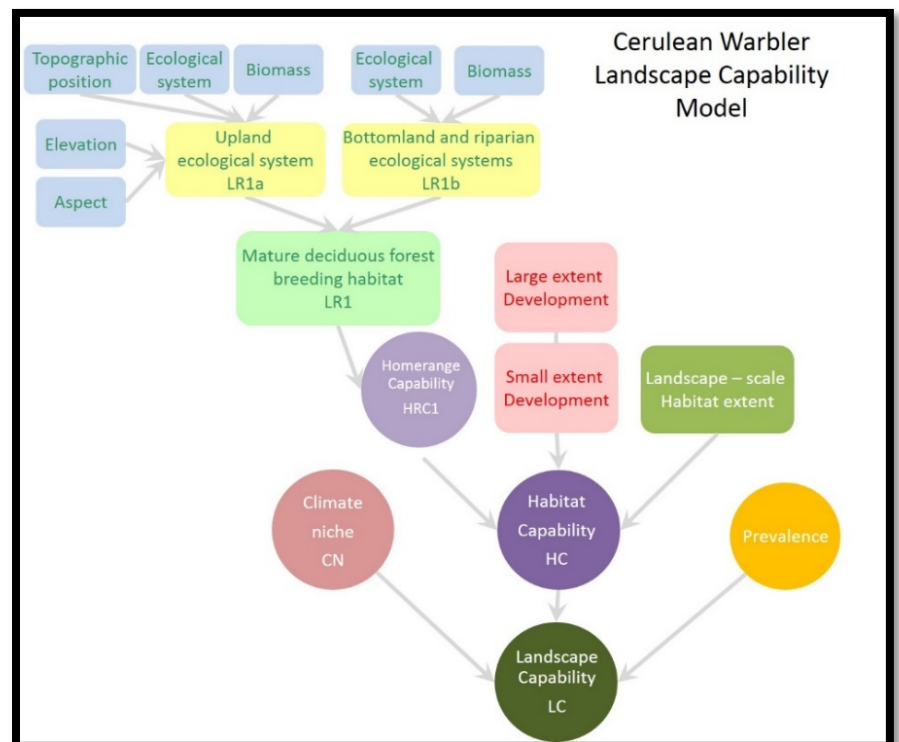


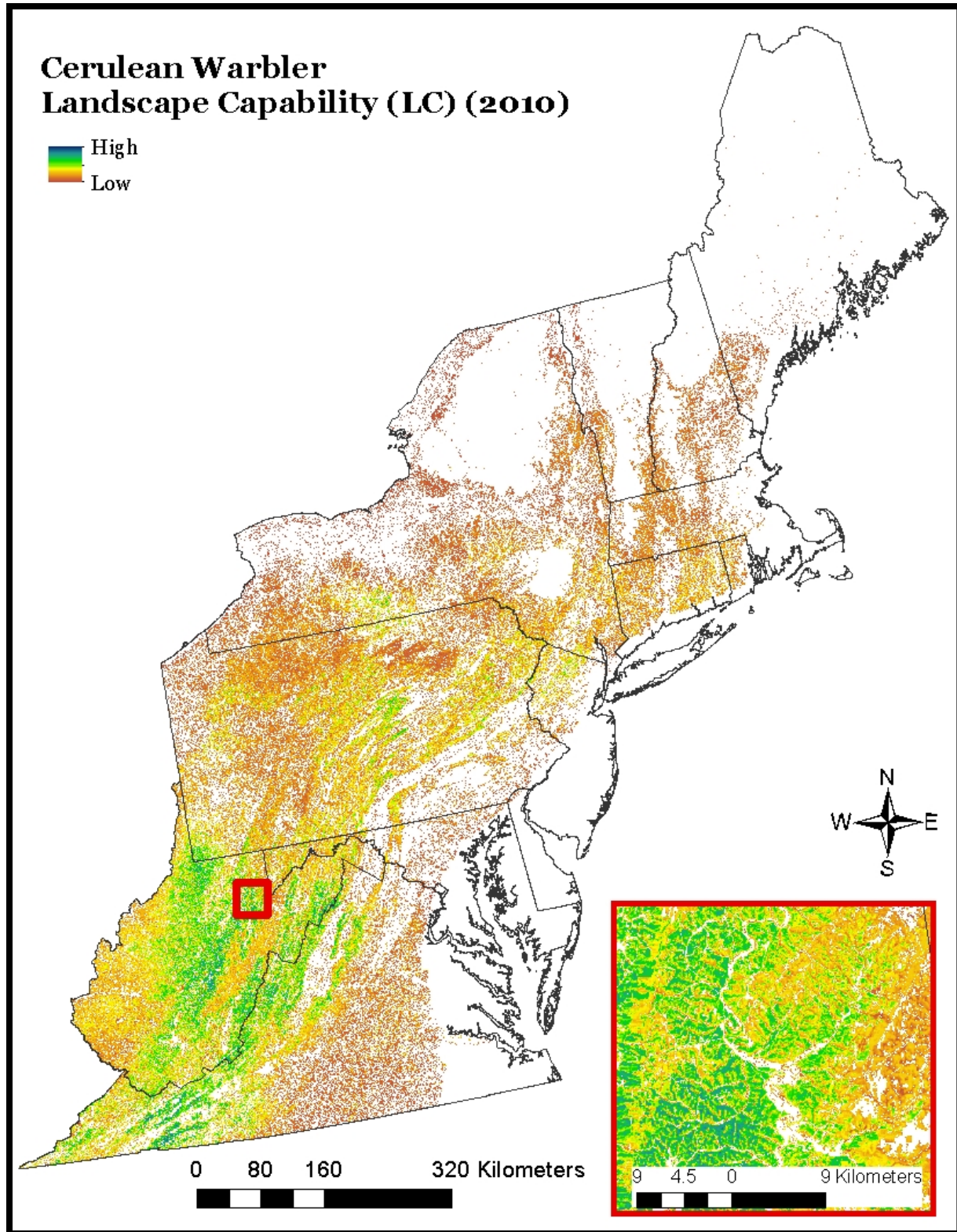
Habitat capability (HC) - The *HC* index considers five factors representing: (1) upland mature deciduous forests for breeding as defined by ecological systems, biomass, elevation (generally > 350m), topographic position (ridges and slopes) and aspect (northwest to southeast), (2) mature bottomland deciduous forests defined by biomass and ecological systems, (3) suitable habitat extent, representing the amount of suitable breeding habitat in the surrounding landscape, (4) large extent development, representing the effects of human-mediated landscape changes that accumulate over a larger geographical area, and (5) small extent development, representing short-distance edge effects such as changes in microclimate, vegetation structure and access by predators that occur on a scale of tens to a few hundred meters from a developed or agricultural edge. The *HC* index represents the relative capacity of a site to provide the habitat needed by the species during the breeding season based on current scientific knowledge.

Climate niche (CN) - The *CN* index considers five climate variables representing: (1) growing degree days, (2) growing season precipitation, (3) annual mean temperature, (4) maximum summer temperature and (5) minimum winter temperature. The *CN* is based on a statistical model derived from 450 absent locations and 450 present locations based on Breeding Bird Survey segment data distributed throughout the Humid Temperate Domain. The *CN* index represents the probability of the climate being suitable for the species based on its current distribution in relation to current climate.

Prevalence index - The Prevalence index is based on the proportional presence of the species across space and is derived from a smoothing of the presumed present and absent locations of the same BBS route segments as used for *CN*. The prevalence index represents the species' relative occurrence based on its current distribution without consideration of environmental determinants and is intended to address biogeographic factors other than habitat or climate (e.g., disease) that influence the species' current distribution.

Landscape Capability (LC) - The *LC* index is computed as the product of *HC*, *prevalence* and *CN*. Thus, the index computed for 2010 reflects the gradient of worst (0) to best (maximum value) sites within the landscape that support this species during the breeding season. Note, we also compute this index for the future (e.g., 2080) based on output from the landscape change model. Model performance was evaluated using independent data from eBird data (516 present and 516 absent locations). Model performance was determined to be acceptable (Kappa = 0.52, Deviance explained=51.4%, AUC = 0.83 and 76% correctly classified).





See technical document on species at https://scholarworks.umass.edu/designing_sustainable_landscapes/ for a detailed description of the Landscape Capability modeling process.